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LS05-82-10-003

Mr. E. P. Rahe, Manager
 Nuclear Safety Department
 Water Reactor Divisions
 Westinghouse Electric Corporation
 Post Office Box 355
 Pittsburgh, Pennsylvania 15230

Dear Mr. Rahe:

SUBJECT: SAFETY PARAMETER DISPLAY SYSTEM (SPDS)

Reference: Letter to Walter A. Paulson, NRC, from E. P. Rahe, Westinghouse Electric Corporation, April 29, 1982, containing Draft Report "Emergency Response Facilities Design and V&V Process," April 29, 1982.

This letter responds to requests made by Westinghouse at the May 6, 1982 meeting, regarding the review of the Safety Parameter Display System (SPDS). At the meeting, Westinghouse discussed a previously forwarded Verification and Validation (V&V) Program (Ref. 1) for the SPDS Design and presented details of the program. Westinghouse also requested approval of the V&V Program.

The staff has completed its review of the program plan and of the material presented at the May 6th meeting. Our review concludes that the V&V program is generally acceptable for the design and development of an SPDS. However, there are some concerns with the program and these are noted in the enclosed report titled, "NRC Staff Review of the Westinghouse Safety Parameter Display System." These concerns must be satisfactorily resolved before completion of the review.

Should you have any questions regarding this letter, please contact Walter Paulson (301-492-7214) of my staff.

Sincerely,

Original signed by

Dennis M. Crutchfield, Chief
 Operating Reactors Branch #5
 Division of Licensing

Enclosure:
 Staff Review of Westinghouse's
 SPDS

cc w/enclosure:

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NRC STAFF REVIEW OF THE WESTINGHOUSE
SAFETY PARAMETER DISPLAY SYSTEM

SUMMARY

On May 6, 1982, the staff met with Westinghouse to discuss the review and audit of the Safety Parameter Display System. Westinghouse discussed system design, the program for verification and validation (V&V) of the design, and the NRC role in the V&V program. Minutes of this meeting have been published (Ref. 4).

Westinghouse requested approval of the V&V program (Ref. 1), which had been previously forwarded to the staff. Based on the review of this program plan and the material presented at the meeting, the staff finds that the program is generally acceptable for the design and development of an SPDS. However, there are some concerns with the program and these are noted herein.

This report serves to document the results from the staff's evaluation of the V&V plan. The next task in this review is the design verification audit which will be held at Westinghouse.

DISCUSSION

The staff's plan for the review of the Safety Parameter Display System is defined in reference 2. A Post-Implementation Review and a Pre-Implementation review are the two types of review plans defined by the reference. In the post implementation type of review, licensees are to prepare a written safety analysis describing the basis on which the selected variables are sufficient for the operator to assess the safety status of the plant. The

licensee also prepares a specific implementation plan for the SPDS. The safety analysis and the implementation plan are submitted to the NRC for review.

The Pre-Implementation Review is similar to the Post-Implementation Review, but places greater emphasis upon the licensee's Verification and Validation Program. The review begins with an evaluation of the licensee's Verification and Validation Program. With an acceptable V&V program, the remainder of the staff's review consists of audits which assess conformance to the program by evaluating problems identified by verifiers and how they were resolved.

The NRC review of the SPDS will be accomplished by an interdisciplinary team drawn from the staff of the Division of Human Factors Safety and the Division of Systems Integration. The Human Factors Engineering Branch will have lead responsibility for the review. The review team will consist of members from the Human Factors Engineering Branch, Instrumentation and Control System Branch, and Reactor System Branch with support from the Core Performance Branch, Procedures and Test Review Branch, and other functional disciplines, as needed. Field meetings for generic design activities will be coordinated with the Region IV Vendor Inspection Program. All in-plant field audits will be scheduled with and attended by representatives of the Commission's Regional Office.

At the May 6, 1982, meeting Westinghouse requested a Pre-Implementation type of review. The system design and the V&V plan were discussed. Westinghouse made presentations on design activities, the development of design basis and

functional requirements, system design specifications, system integration, testing and the NRC V&V process. The design process and the V&V plan both appeared to be logical and well structured. Copies of the slides used in these presentations are contained in reference 4.

Westinghouse expressed concerns with NUREG-0835, stating that the report contained many additional design guidelines over and above the design guidelines stated in NUREG-0696. When the staff asked for specific examples, Westinghouse requested this topic be an agenda item for the next meeting. The staff agreed.

After evaluating the data and information supplied by Westinghouse, the staff arrived at the following decisions, issues and action items.

1. In terms of a Pre-Implementation Review, Westinghouse requested staff approval of the previously forwarded V&V program plan (Ref. 1). Based on the review of this program plan, and the material presented at the meeting, we find that the V&V program is generally acceptable for use in the design and development of an SPDS. However, there were some concerns and these are noted herein.
2. The issue of verification by a qualified person other than the original designer was discussed. Westinghouse proposed using personnel within the same design group as a verifier. The staff expressed concerns for common mode error if personnel within the same design group were used. This issue remains unresolved and is an agenda item for the next meeting.

3. The staff's audit of design validation was also discussed. Westinghouse proposed that once the V&V Plan was approved, subsequent audits by the staff should concentrate on quality assurance. The staff disagreed. Technical aspects of the design will also be audited. In design validation, the staff will audit test results to assess system performance in meeting the functional requirements. The staff need not be present when these tests are run.
4. In Section 2.5.3, "System Integration and Factory Acceptance Test" of the draft report in Reference 1, there is no mention made of integrating the human component into the system. Since the user is a part of the integrated system, there should be some allowance made for man-in-the-loop testing during system validation. This would help to identify system deficiencies in user acceptability, display meaningfulness, user comprehension, utility, and so forth. Such testing should be done using a sample of operations people who are representative of the end-user population rather than Westinghouse engineers or instructors. Since the primary function of an SPDS is to aid the operator, a formal attempt should be made to validate that this function is being served.
5. The scope of the SPDS review is another issue. The current staff review of the SPDS will be limited to the primary function that is an aid to control room operators in rapidly and reliably determining the safety status of the plant. All displays, display formats and display pages within the Safety Parameter Display System, which support this function, are considered within the bounds of this review.

Secondary functions, such as data, information and displays, which aid the operator to diagnose an event, or to assist the operator in monitoring the performance of the plant and its systems will not be reviewed at this time. These type of secondary functions, which have been designed into the system, can best be reviewed by the staff after licensees complete the detailed control room design reviews described in NUREG-0700, "Guidelines for Control Room Design Reviews." However, the staff recommends the program for design verification and validation include these secondary functions.

6. Westinghouse's V&V Program does not include SPDS installation verification. The licensee should develop a plan for this activity.
7. Westinghouse's V&V Program does not address a method for modifications to the display system after it has been installed. It is anticipated that the display system will require modifications to correct undetected design errors and to improve the system after evaluating operator suggestions. The licensee should develop a plan for this activity.
8. In the design verification audit, the staff will assess the basis on which the selected parameters for the display have been verified to assist the operator in evaluating the safety status of the plant. This staff effort is consistent with a pre-implementation review and meets the intent of the recommended requirements in SECY 82-111. (ref. 3.) Should the design contain parameters or variables which are plant dependent, these are to be defined and will be reviewed on a plant by plant basis.

This review was performed by personnel from HFEB and ICSB.

References

1. Letter to Walter A. Paulson, NRC, from E. P. Rahe, Westinghouse Electric Corporation, April 29, 1982, containing Draft Report "Emergency Response Facilities Design and V&V Process," April 29, 1982.
2. Memorandum for Darrell Eisenhut, from Roger Mattson, Hugh Thompson, Subject: "STAFF REVIEW OF SPDS," May 4, 1982.
3. SECY 82-111, "Requirements for Emergency Response Capability," March 11, 1982.
4. Memorandum for Voss A. Moore, from L. Beltracchi, Subject: "MINUTES OF STAFF-WESTINGHOUSE MEETING ON SPDS," August 6, 1982.